

1885.
—
VICTORIA.

TWENTIETH REPORT

OF THE

BOARD OF VISITORS

TO

THE OBSERVATORY;

TOGETHER WITH THE

Annual Report of the Government Astronomer.

PRESENTED TO BOTH HOUSES OF PARLIAMENT BY HIS EXCELLENCY'S COMMAND

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TWENTIETH REPORT

OF THE

BOARD OF VISITORS TO THE OBSERVATORY.

TO HIS EXCELLENCY SIR HENRY BROUGHAM LOCH, *Knight Commander of the Most Honorable Order of the Bath, Governor and Commander-in-Chief in and over the Colony of Victoria and its Dependencies, &c., &c., &c.*

We have the honour to report that, on the 6th October, we made our annual visitation to the Observatory, and received the Government Astronomer's Report. We inspected the buildings and instruments, and found everything in excellent condition and in good working order. We were glad to learn from Mr. Ellery that the new Transit Circle, which was erected in 1883, has been found to be eminently satisfactory, and a most valuable addition to the equipment of the Observatory. The Great Telescope continues to work well, and observations of the southern nebulae are being made satisfactorily. The Government Astronomer laid before us at our visitation the first part of the observations made with the Great Melbourne Telescope from 1869 to 1885, which has just been published, and is in course of distribution to other observatories and kindred institutions throughout the world. This publication has been long delayed by the difficulty experienced in obtaining satisfactory reproductions for publication of the drawings of the celestial objects made at the telescope, and we are glad to learn from Mr. Ellery that the difficulty is so far overcome as to enable him to proceed with the issue of this large and most important original undertaking. We find that the work of the Observatory in all its branches is being faithfully conducted under Mr. Ellery's direction, and that the efforts made by him and his officers to maintain the honorable position our Observatory has secured among other national observatories are generally recognised.

In our Report of last year, we recommended that a small observing party should be sent to observe the total eclipse visible in New Zealand on the 9th of September last, but the Government Astronomer informs us that, on full consideration of all the conditions involved, which are detailed in his Report, he decided not to advise the despatch of the expedition.

We observed with satisfaction that the interior of the Observatory had been renovated throughout, no repairs of the kind having been effected since the erection of the building in 1862.

We also noted the necessity for some repairs and painting to the Great Telescope building, as well as some of the detached buildings in the grounds, and more especially the necessity for metalling or gravelling the carriage approach from the park to the Observatory, and we venture to express the hope that these necessary works may be effected during the current year.

GEO. VERDON, F.R.S., Chairman,
F. STANLEY DOBSON, M.A., LL.D., F.L.S.,
MARTIN H. IRVING,
W. C. KERNOT,
G. V. SMITH,
J. E. BROMBY, Hon. Sec.

REPORT OF THE GOVERNMENT ASTRONOMER TO THE BOARD OF VISITORS TO THE OBSERVATORY.

September, 1885.

THE Report which I have now the honour to submit to the Board of Visitors to the Observatory refers to the year ending 30th June last.

Since the last visitation on 11th August, 1884, there has been but little change in either the staff or the work of the Observatory, except that the new transit instrument of 8 inches aperture, which at that time had just been erected, has now been in continuous use for all the meridian work of the Observatory since 22nd August, 1884, and has proved very satisfactory in every respect.

I.—PERSONAL ESTABLISHMENT.

The whole staff of the Observatory now comes under the operation of the new Public Service Act of 1883, but the only change it brings about in the Observatory is that several members of the staff, whose position has hitherto been regarded as of a temporary character, have been classified, and occupy permanent positions in the service.

The staff at the present time is as follows:—

Mr. ELLERY, Director, Government Astronomer;
Mr. WHITE, Chief Assistant;
Mr. MOERLIN, Assistant;
Mr. GILBERT, ,"
Mr. BARACCHI, ,"
Mr. PRINGLE, ,"
Mr. KEMP, ,"
Mr. INGAMELLS, ,"
G. SWANSON, Mechanic;
J. BURLEY, Messenger;
J. GRIEVE, Workman.

The distribution of duties has remained the same throughout the year.

II.—GROUNDS AND BUILDINGS.

The grounds have been considerably improved, and, as funds are now voted for keeping it in order, I hope to continue the improvement until it is in really good order. There are about six acres, a large portion of which is in shrubberies; these, with the walks between the various buildings and instruments, require constant attention to keep them in a proper state.

In April last, the whole of the interior of the Observatory was re-painted and generally renovated. The dome of the photoheliograph room, which had been showing signs of weakness and getting a little out of shape, was thoroughly repaired last June, and the dome strengthened throughout with iron-band bracing. The movable roof of the great telescope continues to work well, but the whole of it requires re-painting. The basement of the magnetograph house got flooded in June, in consequence of the pipes for draining the basement having become stopped up by the growth of roots of trees within it. The repairs to this involved a considerable amount of work, and it became necessary to construct a well and cesspit, so that the drain pipes can be more easily reached in case of any future difficulty of the same kind. The shutters, &c., of the new transit room have been found by experience to be very convenient and easily worked; indeed, all the arrangements in connexion with the new transit are found to be very satisfactory.

Some slight repairs to the absolute magnet house are required, which I hope to get effected very shortly.

With the exceptions mentioned, the Observatory buildings generally are in good repair and working order.

III.—INSTRUMENTS.

The great telescope has continued to do satisfactory work, but the dropping of the north pivot increased so much in the autumn that it became necessary to adjust it without further delay. This was satisfactorily done by aid of simple screw-jacks, and the whole instrument, after a careful and thorough overhaul and cleaning, was re-adjusted throughout, and all slack parts of the motion set right. It may now be regarded as in excellent working order. The optical parts are also in a satisfactory condition, and, although the brilliancy of the mirrors has considerably diminished, its capacity for work is not sensibly lessened. The very heavy dews and the damp fogs, which have been so prevalent on fine nights during the last few months, have given much trouble by leaving films on the large mirror, which would not always dry off even in full sunlight.

The new transit circle has been in full work since the 22nd August last year, and has given very little trouble as regards adjustment since it was finally got into position. For facility

in observing, excellence of performance, and good results, it exceeds my expectations; and, although no systematic determination of errors of pivots or circles have yet been entered upon, the results of the work show that whatever errors may be found in these directions will certainly be very small. The instrument throughout reflects great credit upon the makers—Messrs. Troughton and Simms. One small addition has been made to it since its erection, namely, two very light contact keys (for chronographic registration) were fixed to the tube near the eye end. This arrangement is found much more convenient than an independent key, which monopolizes one hand of the observer, but, with the attached keys, both hands are free for micrometers, &c., except at the moments of contact.

It is necessary during observations with the transit circle to frequently obtain thermometer readings in the open air. To obviate the continual running out-doors for this purpose, I have erected a small thermometer-stand about 50 feet from the building, and arranged to read the scale from inside the transit room by means of a telescope fixed in the south door. The necessary illumination for reading the thermometer at night is given by a small incandescent lamp, the current for which is supplied by a four-cell bichromate battery, whose elements are always out of the fluid, except at the moment of reading. This battery is inside the transit room, just under the thermometer telescope, and the observer has only to put his foot on a treadle to immerse the plates and illuminate the thermometer scale. Mr. White states this is a most convenient arrangement, and is thoroughly appreciated by all the observers. Of course, proper precautions are taken that no heating of the thermometer bulb occurs from the incandescent lamp.

Both the south (8") and north (4½") equatorials continue in capital working order, and have been in constant use throughout the year. The dome of the latter instrument continues to work very well indeed since the repairs in 1884, referred to in my last report.

The photoheliograph is also in good order. An alteration has been made in this instrument, so as to secure a picture of 8 inches diameter, instead of 4 inches as formerly. A similar change has been made in the South Kensington and other photoheliographs; and, in 1884, I sent to Dallmeyer for a new secondary magnifier and camera for the enlarged picture. These were received from London a short time since, and have been fitted to the telescope. So soon as the necessary focal adjustments are completed, the series of larger sun pictures will be commenced.

The Solar Physics Committee, at South Kensington, having undertaken the measurement and tabulation of all sun pictures obtained at British and colonial observatories, our stock, consisting of 1,712 photographs on glass, was sent to London in March last, and arrived with only thirteen breakages.

The self-recording meteorological and magnetical instruments are in the usual good order, and continue to work satisfactorily. The argento-bromide paper used for our photographic registration maintains its character for certainty, clear pictures, and economy, and we should be sorry to have to revert to the old processes. The sensitiveness of the paper obtained latterly seems to be greater than at first, and I have had (as they have done at Kew) to reduce the intensity of the spots of light, by means of dark-blue glass, until they are no longer visible to the eye, and even then the traces produced are strong and intensely black lines.

The meteorological stand has been removed about 80 feet south of its old position. This was rendered desirable because the walls of the new transit room were within 45 feet of it in its old position. The removal took place on the 19th February. On the 3rd March I got the earth thermometers lifted, and on the 12th placed near the new position of the stand. On lifting these thermometers, the wooden boxes in which they were fixed were found so thoroughly decayed that there was great risk of breaking the long stems. I got them transferred into iron pipes, surrounded by sand and sealed up watertight, before placing them in their new position, where they are now safely installed.

The clocks and chronographs continue to work well. The new barrel chronograph, constructed for use with the new transit circle, has been in constant use throughout the year. One or two slight modifications which experience indicated as desirable have been effected. The ruling pen was not found reliable in use; it was therefore abandoned for a form of syphon pen, with glass nib, which has turned out all that could be desired. On the movable carriage which works the pen in unison with the clock, a light upright brass pillar is fixed; upon this slides a holder, in which a glass reservoir is clamped. This reservoir, by means of a projecting glass tube and a piece of small india-rubber tubing, is connected with a fine capillary glass pen, resting very lightly on the paper on the barrel. The ink used is a mixture of one part *glycerine* and seven parts *Stevens' red ink*. This is found by experience to be always fluid, and to be free from fungus or small particles liable to plug the pen. The ink is drawn from the reservoir to the pen point by exhaustion, with a glass tube fitted for the purpose. When once the ink flows through the capillary pen, it will continue to mark from month to month, without any further trouble than occasionally sliding the reservoir a little up or down on the pillar to obtain the requisite "head" and replenishing it with ink as occasion may require.

IV.—THE LIBRARY.

The donations received from other observatories and kindred institutions are yearly increasing. Exclusive of periodicals, the Observatory has received during the past year 265 volumes. A catalogue of these donations is given in the Appendix.

Since the formation of the new catalogue, a redistribution of the books and bookshelves has been found desirable, and steps are now being taken for a careful arrangement to facilitate reference, the principal subjects being, as far as possible, grouped together.

V.—PUBLICATION.

The first part of the results of the work with the great telescope, from its first erection in 1869 to the present date, has, I am happy to report, at last been published, and copies are now on the table. This part contains a description of the telescope and its accessories, the modes of observation, measurement and drawing adopted in the revision of the southern nebulae, and also lithographs and descriptions of 49 nebulae, as well as heliotype plates of the telescope itself and of the telescope building. It will be at once distributed among the various observatories and scientific societies of the world, and I hope to follow it up very shortly with other parts, containing plates and descriptions of all the nebulae hitherto observed.

The satisfactory reproduction of the drawings of the nebulae for this publication still remains a difficulty, and, although the lithographs completed are fairly successful, they cannot be considered all that could be desired.

The sixth volume of the Results of Astronomical Observations was published in February last, and has already been distributed. This volume gives the results for the years 1876 to 1880 inclusive.

The monthly record of meteorology and terrestrial magnetism is published up till April, 1885, and the numbers up to June are in the printer's hands.

Some progress has been made with the Results of Meteorological Observations for the last ten years, and valuable tables of mean monthly and annual pressures. Mean temperatures and mean ranges of the thermometer and of annual and monthly rainfall have been already prepared, and it is intended to proceed with this as quickly as possible.

A rainfall map for Southern Australia and Tasmania for 1883 was issued in October last, and that for 1884 is now in the press.

VI.—THE WORK OF THE OBSERVATORY.

Transit Circle Observations.—The meridian work, which has been almost exclusively done with the new transit circle since August 22nd, 1884, comprises, besides the usual observations of fundamental clock stars, a set of stars selected by Dr. Auwers, for reduction of zone and transit of Venus observations, stars observed with comets, and stars selected from the Melbourne zones. During the winter months, the places of the standard circum-polar stars have been re-observed.

The number of observations with the transit circle have been as follows:—

Right Ascension Observations	...	...	...	2,287
Polar Distance ditto	...	...	...	983
Observations for Instrumental Errors, viz.:—				
Collimation	...	...	...	188
Level	...	...	...	221
Nadir	...	...	...	200
Runs of Microscopes	...	...	...	50
Flexure of Telescope	...	...	...	13

All the individual observations are completely reduced. When the results of the years 1871 to 1880 had been nearly formed into the second Melbourne general catalogue, the new transit circle arrived, and it was thought desirable to incorporate the whole of the results obtained with the old instrument up to the date of its disuse, so that the new catalogue will now contain the meridian results from 1871 to 1884 inclusive.

Work with the Great Telescope.—The work done with this instrument has been chiefly confined to a revision by Mr. Baracchi of southern nebulae, already observed by former observers, preliminary to publication. As already stated, the first part of "Observations with the Great Melbourne Telescope" has been published, but, before doing so, it was thought desirable to again observe all those nebulae which will be described in this and the following parts, so as to bring the revisions up to as late a date as possible; very little new work has, therefore, been entered upon. One hundred and seventy-two nebulae have been re-observed and re-drawn to compare with the plates to be published, and the observer's notes embodied with the descriptions; η Argus and 30 Doradus have also been revised. Of the 172 nebulae observed, 140 are Herschel's, 3 are new ones discovered by the late Mr. Turner, and 29 new or not identified, found by Mr. Baracchi. Many of these nebulae have been observed twice, and some three times, and none were completed until they had been observed on a first-class night.

There are still 240 nebulae observed by former observers which have yet to be finally revised before publication. It is hoped this may be done during the coming summer.

The past winter has been very unfavorable for this class of work, owing to the frequent foggy and damp weather which has prevailed.

Among many occasional observations made with the great telescope throughout the year, I may mention the formation of three regional charts of faint stars following ϵ Orionis, η Virginis, and η Serpentis, at the request of the American committee for establishing standard magnitudes of faint stars.

The extra Meridional Work done with the south or north equatorials comprises observations of Barnard's comet on 25 nights, between July 26 and October 12, 1884; Wolfe's comet on seventeen nights, between September 17, 1884, to March 19, 1885; measures of α Centauri once a month; besides experiments with Professor Pritchard's method of star photometry.

Photoheliograph.—There have been several interruptions to the continuity of the sun photographs during the past year, owing to derangements of the instrument and dome, and only 130 pictures were obtained up till June 11th, when the instrument was dismantled for repairs prior to commencing the larger pictures.

Sunshine Recorder has supplied a regular record of hours of sunshine throughout the year.

Meteorology and Terrestrial Magnetism.—This department of the Observatory work has gone on much as usual. The magnetographs, thermograph, and barograph have furnished continuous photographic records, but the electrograph has only been used for occasional observations. The anemographs (Robinson and Hagemann) have worked very well throughout the year.

The eye observations of all the meteorological instruments at 6 a.m., 9 a.m., 3 p.m., and 9 p.m. have been continued without break as heretofore.

Rain-gauges.—We have now 251 rain-gauges distributed over the colony, from which we obtain regular monthly registers. During the year under review, 35 new gauges have been established in various localities.

The various country meteorological stations continue to supply regular and satisfactory records. The principal stations are Portland, Cape Otway, Wilson's Promontory, Gabo Island, Echuca, Ballarat, and Sandhurst; but we also receive less complete records from twenty other stations, besides rainfall statistics from 224 other localities.

Distribution of Time, Time-balls, &c.—No addition or change has been made in this direction during the year. The time-signal system on the telegraph lines has been carried out as heretofore. The Williamstown time-ball has failed 12 times out of 298, principally owing to interruption on the telegraph lines.

Post Office Clock.—There have been several accidental breaks in the steady rate of this clock during the year, the cause of which could not be discovered. It also had to be stopped for about ten days for repairs and cleaning. Apart from these interruptions, the clock has fully maintained its character as an excellent timekeeper.

The Tide-gauge, Williamstown, has furnished a continuous record of the tides in Hobson's Bay during the twelve months.

There have been 10 chronometers rated, 6 watches tested and rated, and 37 aneroids tested in vacuo for the public during the year.

VII.—INTERCOLONIAL WEATHER TELEGRAPHY.

Some important additions to Australian reporting stations have been made during the year, two of the most important having been established by the Government of Western Australia, on the extreme west coast of the continent, which contribute in a very important degree towards a meteorological blockade of the Australian coast lines. On the north, however, a few more stations are required to make it thoroughly complete. The intercolonial weather system is making very satisfactory progress from year to year, the chief requirement now being a more thorough representation of Queensland and Central Australia. In regard to the former, I am glad to find the Government have invited Mr. Clement Wragge, a well-known meteorologist, to inspect and report upon the meteorological work done in that colony with a view to its improvement.

There is still much to be desired as regards the prompt and regular transmission of weather telegrams, and the advantages the weather system would afford are much lessened by delay in this direction, which appears, however, to be at present inevitable, for we get all possible assistance from the Telegraph Department in expediting the weather business over which it has any control.

VIII.—GENERAL.

In my last report I referred to the eclipse of the sun, which occurs on September 9th, visible in New Zealand in the neighbourhood of Cook's Straits, and stated I considered it desirable to organize a small party to go to New Zealand for observing it; but upon after consultation with Mr. Russell, the Government Astronomer of Sydney, and consideration of the probabilities of clear weather about Cook's Straits at that time of the year, and the short duration of totality, as well as of the absence of any important question likely to be solved by this phenomenon, I eventually decided not to recommend sending an observing party from here.

The earth-tremors and slight earthquakes which have been so frequent during the last few years in Bass' Straits, the south coast of Victoria, and the north-east coast of Tasmania still continue and appear to originate from the same seismic centre at sea to the eastwards of Flinders' Island.

Nothing has been done towards establishing any earthquake instruments. I have had an opportunity, however, of consulting with Professor Milne, of Tokio, Japan, who was in Melbourne on a visit lately, and he advises the use of a new form of pendulum seismometer which he has lately adopted for recording tremors and minor earthquakes. I propose therefore to make a trial of this form of instrument.

As regards the work of the Observatory for the current year, it is not intended to make any great change or new departure. The meridian work will be proceeded with as usual, and it is intended to determine the errors of division and of form of pivot of the transit circle, and to arrange for securing reflection observations whenever desirable. With the great telescope the revision of the nebulae for publication will be proceeded with, and all the routine meteorological, magnetic, and other physical work will be carried on as usual.

ROB. L. J. ELLERY,
Government Astronomer.

October 6th, 1885.

APPENDIX.

BOOKS, ETC., PRESENTED TO THE OBSERVATORY.

Title and Author.	By whom Presented.	
Report of the Astronomer Royal to the Board of Visitors of the Royal Observatory, June 7th, 1884	Greenwich Observatory	England.
Greenwich Observations, 1882	Ditto	"
Greenwich Astronomical Results, 1882	Ditto	"
Greenwich Spectroscopic and Photographic Results, 1882	Ditto	"
Greenwich Magnetical and Meteorological Results, 1882	Ditto	"
Spectroscopic Results for the Motions of Stars in the Line of Sight obtained at the Royal Observatory, Greenwich, in the Year 1884. No. 8	Ditto	"
Daily Weather Reports: July, 1883, to December, 1884	Meteorological Office	"
Reports of the Meteorological Council for the Years ending 31st March, 1883, 1884. Official. Nos. 58 and 64	Ditto	"
A Barometer Manual for the Use of Seamen. Official. No. 61	Ditto	"
Charts of Surface Temperatures for the Atlantic, Pacific, and Indian Oceans. Official. No. 59	Ditto	"
Principle of Forecasting by means of Weather Charts. Hon. R. Abercromby. Official. No. 60	Ditto	"
Quarterly Weather Report: July, 1876, to June, 1877	Ditto	"
Hourly Readings, 1882: April to December	Ditto	"
Meteorological Observations at Stations of the 2nd Order for the Year 1880. Official. No. 57	Ditto	"
Weekly Weather Reports. Nos. 1 to 52. Vol. I.	Ditto	"
Monthly Weather Reports: January to December, 1884	Ditto	"
Memoirs of the Royal Astronomical Society. Vol. XLVIII., Part I. 1884	Royal Astronomical Society	"
Monthly Notices. Vol. XLIV., Nos. 1, 7, 8, 9; Vol. XLV., Nos. 1-6	Ditto	"
Nautical Almanac for 1888	Nautical Almanac Office	"
Note on the Track of the Total Phase in the Solar Eclipse of September 8, 1885, in its passage across New Zealand. J. R. Hurd, LL.D.	Ditto	"
Radcliffe Observations, 1881	Radcliffe Observatory, Oxford	"
Meteorological Observations for the Year 1884, at Rousden, Devon. C. E. Peek, M.A.	C. E. Peek	"
Report to Solar Physics Committee on a comparison between apparent inequalities of short period in Sunspot Areas and in Diurnal Temperature Ranges at Toronto and Kew. Balfour, Stewart, and W. L. Carpenter	Solar Physics Committee	"
Statistical Abstract: Colonies and Possessions of the United Kingdom. 20th number. 1868-1882		"
Report of the Meteorological Commission for the Year 1883...	Meteorological Commission	Cape of Good Hope
Heliometer Determinations of Stellar Parallax in the Southern Hemisphere. Drs. Gill and Elkin	Dr. Gill	"
Report of the Superintendent of the Natal Observatory, 1883-4. Edmund Neilson	Government Astronomer	Natal
Dunsink Astronomical Observations. 5th part	Dunsink Observatory	Ireland
The Scientific Transactions of the Royal Dublin Society. Vol. III., Series II. Nos. 4, 5, and 6	Royal Dublin Society	"
Scientific Proceedings. Vol. IV. (N. S.), Parts 5 and 6. July, 1884, and January, 1885	Ditto	"
Catalogue of 6,415 Stars for the epoch 1870. Professor Grant	Glasgow University Observatory	Scotland
Proceedings of the Philosophical Society of Glasgow. Vol. XV. 1883-4	Philosophical Society of Glasgow	"
Journal of the Scottish Meteorological Society. 3rd series. No. 1...	Scottish Meteorological Society	"
Map of the average Rainfall of India. H. F. Blandford, F.R.S.	Indian Meteorological Office	India
Report on the Meteorology of India in 1882. H. F. Blandford	Ditto	"
Report on the Administration of the Meteorological Department of the Government of India, 1883-4. H. F. Blandford	Ditto	"
Indian Meteorological Memoirs. Vol. II., Part 3	Ditto	"
Results of Meteorological Observations at Six Stations in India: January to October, 1884 (except April)	Ditto	"
Bengal Meteorological Results: 1 June, 1884, to 25 April, 1885	Ditto	"
Bengal Meteorological Abstract: May, 1884, to March, 1885	Ditto	"
Bengal Rainfall, May, 1884, to March, 1885	Ditto	"
Meteorological Observations at Singapore, 1841-5. Captain Elliott	Government Astronomer, Madras	"
Administration Report, 1883-4. Miss E. J. Pogson	Meteorological Reporter, Madras	"
Magnetical and Meteorological Observations, 1879-82, and Appendixes	Colaba Observatory, Bombay	"
Magnetical and Meteorological Observations, 1883	Ditto	"
Results of Meteorological Observations, 1883	A. V. Nursingrow, Vizagapatam	"
Account of the S.W. Monsoon Storms of the 26th January, and 10th to 15th November, 1883. John Eliot, M.A.	Reporter to Bengal Government...	"
Rainfall of Cherrapungi. John Eliot	Ditto	"
Reports of the Mining Registrars, September 30, 1884, to March 30, 1884. (Quarterly.)	Mining Department	Victoria
Annual Report of the Acting Secretary of Mines and Water Supply to the Minister, 1884	Ditto	"
Diamond Drills in Victoria	Ditto	"
Victorian Year-Book for 1883-4. Hayter	Government Statist	"
Report of the Melbourne Harbour Trust Commissioners	Harbour Trust, Melbourne	"
The Physical Geography of New South Wales. H. C. Russell, B.A.	Sydney Observatory	New South Wales
Results of Rain and River Observations in N.S.W., 1883 and 1884	Ditto	"
New Double Stars. H. C. Russell	H. C. Russell	"
Anniversary Address. Hon. Professor Smith, C.M.G.	Royal Society of New South Wales	"
Journal and Proceedings of the Royal Society of New South Wales, 1883	Ditto	"
Report on the Post Office, Telegraph, and Observatory Department. C. Todd, C.M.G.	Adelaide Observatory	South Australia
Meteorological Observations at Adelaide during the Year 1882	Ditto	"

APPENDIX—continued.

Title and Author.	By whom Presented.	
Papers and Proceedings of the Royal Society of Tasmania for 1882 ...	Royal Society of Tasmania ...	Tasmania
Meteorological Observations made at Hobart and other places during the Year 1884. Captain Shortt	Meteorological Observer ...	"
Observations on Mr. R. M. Johnston's Vital Statistics. A. B. Biggs	A. B. Biggs ...	"
Meteorological Report for 1883. Dr. Hector	Superintendent, Meteorological Stations ...	New Zealand
Report of the Meteorological Service of the Dominion of Canada, 1882. Two copies	Meteorological Office, Toronto ...	Canada
Monthly Weather Review: May, 1884, to April, 1885 ...	Ditto ...	"
General Meteorological Register, 1884 ...	Toronto Magnetical Observatory ...	"
Descriptive Sketch of the Physical Geography and Geology of the Dominion of Canada. Drs. Selwyn and Dawson. With maps	Geological and Natural History Survey ...	"
Comparative Vocabularies of the Indian Tribes of British Columbia, with map. Drs. Tolmie and Dawson	Ditto ...	"
The Parallax of α Lyrae and 61 Cygni. Professor Asaph Hall ...	Washington Naval Observatory ...	United States
Observations of the Great Comet of 1882 ...	Ditto ...	"
Washington Observations. Vols. XXV. and XXVI. 1878 and 1879	Ditto ...	"
Report of the Superintendent of the United States Naval Observatory for the Year ending October, 1884	Ditto ...	"
Report to the Secretary of the Navy on recent Improvements in Astronomical Instruments. S. Newcomb	Ditto ...	"
Astronomical Papers of the American Nautical Almanac Office. Vol. II., Parts 1 and 2; and Vol. III., Parts 1, 2, and 3, viz. :—	Nautical Almanac Office ...	"
Co-efficients for correcting Planetary Elements. S. Newcomb ...		
Investigations of Corrections to Greenwich Planetary Observations. Professor Safford		
Development of the Perturbative Function. S. Newcomb ...		
Lunar Inequalities due to Ellipticity of the Earth. G. W. Hill ...	Ditto ...	"
On the motion of Hyperion: A new case in Celestial Mechanics. S. Newcomb		
The American Ephemeris and Nautical Almanacs for 1885-6-7 ...		
Professional Papers of the Signal Service. Nos. 8 to 12, 14, viz. :—		
Recent Mathematical Papers concerning the Motions of the Atmosphere: The Motions of Fluids and Solids on the Earth's Surface. By Professor W. Ferrel	Chief Signal Officer ...	"
Geographical Distribution of Rainfall in the United States. H. H. C. Dunwoody		
Rainfall and Crop Production. H. H. C. Dunwoody ...		
Meteorological and Physical Observations on the East Coast of British America. Orray T. Sherman		
Popular Essays on the Movements of the Atmosphere. Ferrel ...	Ditto ...	"
Charts of relative Storm Frequency for a portion of the Northern Hemisphere. Sergt. J. P. Finley		
The Use of the Spectroscope in Meteorological Observation. Winslow Upton, M.A.		
Annual Report for Year ending June 30th, 1880. 2 Parts ...		
Memoranda on International Scientific Co-operation in Meteorology, Magnetism, &c.	Ditto ...	"
Daily Bulletin of International Observations: September to December, 1877. 4 Vols.	Ditto ...	"
Bulletin of International Meteorological Observations: September, 1881, to August, 1882	Ditto ...	"
Monthly Weather Review: December, 1882, to October, 1883	Ditto ...	"
Meteorological Observations: January to June, 1884; September, 1884	New York Meteorological Observatory, Central Park	"
Smithsonian Report for 1881 ...	Smithsonian Institute ...	"
Publications, No. 6: Double Stars, 1879-80 ...	Cincinnati Observatory ...	"
Publications, No. 1 ...	Washburn Observatory of the University of Wisconsin, Madison	"
Recent Observations of Variable Stars. E. C. Pickering ...	E. C. Pickering ...	"
Light of Comparison Stars for Vesta ...	Ditto ...	"
Observation of Variable Stars in 1884 ...	Ditto ...	"
Report of the Committee A.A.A.S. ...	Ditto ...	"
A Method of Measuring the absolute Sensitiveness of Photographic Dry Plates. By W. H. Pickering	W. H. Pickering ...	"
Annals of the Harvard College Observatory. Vol. XIV., Parts 1 and 2	Harvard College Observatory ...	"
Thirty-ninth Annual Report of the Director ...	Ditto ...	"
The Phases of the Moon. A. Searle ...	A. Searle ...	"
Elements and Ephemeris of the Planet (234) Barbara ...	Leander McCormick Observatory ...	"
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